

Highly directional vertical emission from heterogeneous photonic crystal cavity with elliptical air holes

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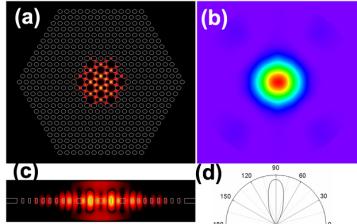


Fig.1 (a) Top view and (c) side view of calculated mode pattern. (b) Far-field image. The center corresponds to the vertical direction. (d) radiation profile.

The emission from photonic crystal (PC) cavity tends to spread over broad angle. Therefore, it is crucial to control radiation patterns of PC cavity mode in order to realize highly directional light source for add/drop filter [1]. As a candidate of the vertical emitters, we chose the resonant mode whose x- or y-directional electric field has even mirror symmetry for both axes and both electric fields are cancelled out along the vertical direction. Through the elongation of air holes of PC, we broke the cancellation condition of the electric field such that vertical emission is allowed. Furthermore, in order to obtain narrow divergence angle, we introduced graphite lattices inside the triangular lattice. Here, a graphite lattice can be considered as a two-dimensional (2D) array of single-cell cavities. The coherent coupling of 2D arrayed cavities enable the reduction of the divergence angle as the number of graphite lattice increases.

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- [1] T. Asano, B. S. Song, Y. Tanaka, S. Noda, *Appl. Phys. Lett.*, **83**, 407 (2003)